ENCLOSURE 3 - Form 2C Item IV-B and Form 2F Item II-B

Copper Source / Minimization Summary Outfall 906 (006)

Permit Part I.E.1 indicated an SWPP goal of reducing copper to the maximum extent practical at Outfall 906. As indicated elsewhere, 906 is the rain event designation of 006 and their flow sources are not separable in any practical way, so 006 flow is a contributor. As we developed our SWPP, we examined site activities for sources that might potentially contribute copper to stormwater. We found no likely significant contributors. We determined that we would monitor quarterly (1/3M) as required by our permit and would follow-up on any observed high copper results with a sampling program to identify and minimize sources. We would also assess the need for pollutants reduction via toxicity testing. We sampled for acute toxicity during November 2005, 2006, 2007, and 2008. Survival rates were 100%. Copper sampling conducted under the current permit prior to November 2006 indicated values below the 13 µg/L Acute Standard indicated in the previous permit's data package (Attachment G). Also, typical results had averaged lower than the prior permit period results. To educate plant personnel, we included stormwater awareness in our plant-wide environmental awareness training conducted during mid-2006. Awareness is continued by "Environmental Tips" and "Environmental Wins" published in the plant's weekly EHS Update (newsletter).

During November 2006, a value of 20 µg/L Cu was obtained at 906. This was followed by values of 52 µg/L in May 2007; 38 µg/L in June; and Nil in November 2007. We observed that Cu results were most likely to exceed 13 µg/L during rain events that were significant enough (> 0.4") for internal Outfall 601 to be discharging to 006. We suspected that subsoil in the 601 drainage area may be affected by a 2003 acetic acid spill, though initially remediated (as reported to DEQ – July 2003 DMR) might retain trace acidity sufficient to allow migration of copper to the (601) sewer system. Beneath the former acetic spill area, we informally sampled normal dry weather flow passing through the main sewer feeding 601. We observed a drop of several tenths pH SU downgradient of the area versus upgradient.

We engaged consultant Groundwater Environmental Services (GES) to assess our suspicion there may be residual acidity in the soil or shallow groundwater from the acetic spill or any other potential former acid sources in the area. They installed piezometers (AKA wells) along the 601 sewer within the former acetic spill area as well as downgradient toward internal Outfall 601 that discharges to 906 during significant rain events. They found soil pHs down to approximately 5 and groundwater pHs down to approximately 6. These pHs are lower than typical values (7.0-7.5) in the 601 sewer upgradient of the area suspected to be affected. GES recommended that we conservatively apply Na_2CO_3 (AKA soda ash) with intermittent pH monitoring of the piezometers until the pH of all piezometers is neutral. The GES report is attached. We applied (broadcast) 2500 lb. of soda ash on December 1, 2008, and again during February 2009. We observed that while soda ash is water soluble, several months of normal rainfall is required to wash it into the soil (all white traces are gone). We are careful to avoid application where water intercepted by the soda ash will run directly to an outfall; nevertheless, we postponed application for several months while we completed any sampling needed for the VPDES permit application. We initially planned to monitor wells monthly; however, since the soda ash takes several months of rainfalls to dissolve and totally disappear, we determined that every two months is a reasonable frequency of well monitoring to determine when the groundwater is neutral. Our pH test data follow:

pH Test Data in Piezometers - Upgradient to Downgradient						
Well Designation	G-2	C-2	B-2	A-2	D-2	E-2
November 2008	7.4	6.7	6.5	5.8	5.8	6.2
January 2009	6.8	*	6.4	5.6	5.9	6.0
March 2009	6.9	*	6.5	5.8	6.1	6.2
April 2009	6.4	*	6.4	6.0	6.2	6.0
July 2009	9.9	*	6.2	6.5	6.1	5.7

*Well C-2 was skipped during these samplings because of standing water.

Because the first two applications did not significantly raise pH in any of the wells, we believe the return of groundwater to pH = 7 near all wells will likely take several more applications. The applications of 2500 lb. each should be are spaced by two to three months to allow incorporation of soda ash into the soil and to avoid overshooting the endpoint of pH 7. Apparently, the soil is resistant to pH change (buffered) and a few more applications are needed. It is also interesting to note that while there has been no increase in groundwater pH, all copper results at 006/906 have been < 10 µg/L since the first lime application. We plan continued soda ash application and monitoring until the sampled groundwater is pH 7 in the wells.

By eliminating potential metals impact at 601 on the permitted Outfall 906, we believe there is no further need for supplemental/diagnostic sampling at this contributor to Outfall 906/006 required under our current permit. We believe that any monitoring at 601 and other contributors to 906/006 are more effectively done under an active SWPP.

HERCULES

Outfall 906 Discharge Assessment Report
Hercules – Aqualon Division
Hopewell, Virginia

Prepared for:

Hercules Incorporated

Aqualon Division

1111 Hercules Road

Hopewell, Virginia 23860-5245

Prepared by:

Groundwater & Environmental Services, Inc.

Exchange Alley Building

23 South 13th Street, Suite 201

Richmond, Virginia 23219

June 2008

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF GRAPHS

LIST OF ATTACHMENTS

1.0 INTRODUCTION

Groundwater and Environmental Services, Inc. (GES) was contracted by Hercules Incorporated (Hercules) – Aqualon Division to:

- perform a subsurface investigation to evaluate the potential source of lower pH and elevated copper observed in Outfall 906; and
- comment on the potential effectiveness of additional surficial soda ash applications.

The Hercules facility is located at 1111 Hercules Road in Hopewell, Virginia. **Figure 1** shows the location of the site property on the USGS topographic quadrangle map for Hopewell, Virginia. The investigation area is situated just to the northeast and southeast of the acetic acid tanks and is depicted on **Figures 2 & 3**.

2.0 BACKGROUND

In February 2003, Aqualon personnel identified a release of acetic acid from a transfer pump associated with the acetic acid tanks located west of Outfall 906. Subsequently, GES conducted two investigations (March 2003 and July 2003) in the swale area to the northeast of the acid tanks where the acid was observed to have accumulated after the spill.

Based on data collected from the previous assessments, porous fill (bricks, clinker, gravel, etc.) was encountered along the swale. The pH of the soil/fill along this swale ranged between 3 and 4 S.U. (several <3) to depths as great as 18 feet. Even though this area was neutralized in 2003 by Hercules personnel to near background pH (i.e., 4.5 S.U.) levels using surface applications of soda ash, there is the possibility that pockets of residual acid still reside deeper in the subsurface and/or the utility backfill just above or surrounding the sewer line. It is these residual pockets that have been suspected to be the cause of the lower pH/elevated copper measured in Outfall 906 following a rain event.

3.0 PROJECT OBJECTIVE

The primary objective of this focused assessment was to evaluate and document that the source of elevated dissolved copper observed in Outfall 906 is a result of residual acid being leached during rain events from the area of the 2003 acid spill. The assessment activities were designed to confirm the findings of the previous data and to expand the assessment footprint to evaluate the lateral (east-west) and vertical (north-south) extent of the low pH/elevated copper groundwater in the area. The investigation was also intended to assess the subsurface conditions along the center

line of the swale and adjacent to subsurface features (i.e., sewer lines and manhole), which could serve as potential migration pathways.

In addition, this assessment was conducted to collect the necessary data to enable Hercules personnel to design a remedy to neutralize any remaining acid.

4.0 ASSESSMENT ACTIVITIES

4.1 PIEZOMETER INSTALLATION

On August 16, 2007, GES personnel mobilized to the site to install six (6) piezometers in the swale area and near Outfall 906, northeast and east of the acid tanks where the 2003 spill originated. The purpose of the piezometer locations was to evaluate the presence of and extent of any residual acid. The piezometers were installed in locations which generally corresponded to the areas where lower pH (i.e., <4.0 S.U.s) values were observed during the previous assessments (SB-A-2, SB-B-2, SB-C-2, SB-D-2, and SB-G-1). The piezometers were also installed in close proximity to the sewer line and at depths that are close to the sewer elevations.

On August 16, 2007, during the attempted installation of piezometer G-1, refusal was encountered at 16 feet below ground surface (ft bgs). Therefore, the piezometer location was abandoned and moved to a nearby location several feet away. Piezometer G-2 was subsequently installed at the upgradient end of the swale, adjacent to the storm sewer manhole designated by Hercules personnel as "AG2 MH". Piezometer C-2 was installed south of G-2 and just east of the associated sewer line. Piezometer B-2 was installed south of C-2, alongside the roadway and just west of the associated sewer line. On August 17, 2007, piezometer A-2 was installed southeast of B-2 at the most downgradient portion of the swale and just west of the associated sewer line. Piezometer D-2 was installed near the unloading rack and the manhole designated by Hercules personnel as "AD2 MH". Piezometer E-2 was installed southeast of D-2 at the most downgradient location prior to internal Outfall 601 which discharges to Outfall 006 (906). Piezometer locations were not formally surveyed. Approximate piezometer locations in relation to the former acid spill area, swale, and storm sewer line/manholes are depicted on **Figures 2 & 3**.

Installation activities were conducted by a two-man crew from Parratt-Wolff Inc. of Hillsborough, North Carolina, under the direction of an experienced GES field scientist. A private utility markout was contracted to screen each of the proposed locations prior to drilling. Prior to the well installation, GES personnel hand-augered to approximately four ft bgs to further clear for potential underground utilities.

The well installations were performed using direct-push technology with a tractor-mounted rig. Piezometers A-2, D-2, and E-2 were installed to 28 ft bgs and screened from 18 to 28 ft bgs. Piezometer B-2 was installed to 27 ft bgs and screened from 17 to 27 ft bgs. Piezometer C-2 was installed to a terminal depth of 21 ft bgs and was screened from 11 to 21 ft bgs. Piezometer G-2 was installed to a terminal depth of 24

ft bgs and was screened from 14 to 24 ft bgs. Each piezometer was completed with 10 feet of 1-inch 10-slot PVC screen and 1-inch solid PVC riser extending to approximately 1 to 3 feet above the ground surface. Filtration-grade #2 sand (filter sand) was used to pack the annular space from the terminal depth of the piezometer to approximately 2 feet below ground surface. A bentonite seal of approximately 2 feet was placed above the filter sand to extend to the ground surface. All piezometers were sealed with a locking, watertight, expandable gripper plug. A summary of the depth of installation and screened intervals for each of the piezometers is presented in **Table 1**.

4.2 SWALE FILL / SUBSOIL SAMPLING

During piezometer installation, soil samples were collected on a continuous basis to the termination depth of each boring. GES personnel logged each boring and noted any changes in lithology, color, and moisture with depth. No visual or olfactory evidence of environmental impacts and no residual acid was identified during the soil sampling or well installation activities. Representative soil samples were collected from the four-foot sample sleeves, mixed with deionized water into a slurry, and tested for pH using an Oakton pH meter. To ensure accuracy, the pH meter was calibrated twice a day using a three-point calibration method with 4.01, 7.0, and 10.0 calibration solutions. A split sample from each sample used to measure pH was also placed in a ziplock bag in case additional testing (leach tests) may prove beneficial in evaluating the source(s) of elevated copper in Outfall 906. The samples were stored onsite at Hercules' environmental lab in a temperature-controlled refrigerator in the event that analytical testing is recommended. During drilling activities, water was observed in soil lithology at depths ranging from 15 to 25 ft bgs. Following well completion, water levels became static at approximately 6 to 24 ft bgs in A-2, B-2, C-2, D-2, E-2, and G-2.

Boring logs for each piezometer summarizing the observed lithology, water levels, pH soil screening results, and well construction information are included in **Attachment A**. Similar to the previous assessments in 2003, porous fill was encountered in the borings located along the swale to depths as great as 24 ft bgs, followed by layers of clay and silty sand in some locations. The soil pH results for each boring are also included in **Table 2** and are compared to the historical data of the corresponding boring locations from previous assessments.

In addition, GES personnel collected a total of 20 shallow surficial soil samples (HA-1 through HA-20) from hand-augered borings (0-0.5 ft) in the local drainage area for Outfall 906 to evaluate the possible impact that the "background" pH levels may have on the dissolved metals in the stormwater. The approximate locations of each of the hand-augered borings are depicted on **Figure 2** and the corresponding pH results for the samples are presented in **Table 3**.

Disposable sampling materials and nitrile sampling gloves were disposed of onsite as nonhazardous solid waste. Soil cuttings and soil sample remnants were placed in a clean fiber drum for proper disposal by Hercules pending analytical testing results.

4.3 PIEZOMETER GROUNDWATER SAMPLING

On August 17 and 20, 2007, GES personnel conducted piezometer development on the newly installed piezometers (A-2, B-2, C-2, D-2, E-2, and G-2). It should be noted that 4.68 inches of rainfall was recorded at the site between August 16 and 19, 2007.

Each piezometer was purged with a peristaltic pump and disposable polyethylene tubing until either a turbid-free discharge was obtained or the well ran dry. During purging activities for A-2 and B-2, the water level in the well was quickly drawn down, indicating a low level of recharge from the surrounding formation. Piezometers C-2, D-2, E-2, and G-2 did not run dry during purging activities.

Once groundwater levels recharged to the well or the water levels remained stable during purging, water quality samples were collected and analyzed in the field for pH, dissolved oxygen, conductivity, temperature, and oxidation-reduction potential for piezometers A-2, B-2, C-2, D-2, E-2, and G-2. Water quality parameters recorded for the piezometers are presented in **Table 1**. No free-phase acid was observed in any of the piezometers.

Disposable sampling materials, including the downhole polyethylene tubing, silicon pump tubing, and nitrile sampling gloves, were placed in a designated container for disposal by Hercules as a nonhazardous solid waste.

On September 28, 2007, GES personnel returned to the site to collect an additional round of water quality readings of the groundwater from each piezometer (see **Table 1**). It should be noted that there was no rainfall for six days prior to the second round of water quality parameter readings. Following the collection of water quality parameters, aqueous samples were collected from A-2, B-2, C-2, D-2, E-2, and G-2 in laboratory provided bottleware. The samples were stored onsite at Hercules' environmental lab in a temperature-controlled refrigerator with proper chain-of-custody and were subsequently analyzed for dissolved metals (zinc, copper, silver, and nickel) via Method 200.7 by Universal Laboratories (Universal) of Hampton, Virginia. The groundwater quality analytical results are summarized in **Table 4**. The complete analytical report is included in **Attachment B**.

Disposable sampling materials, including the downhole polyethylene tubing, silicon pump tubing, and nitrile sampling gloves, were placed in a designated container for disposal by Hercules as a nonhazardous solid waste.

5.0 RESULTS

5.1 SOIL PH RESULTS

5.1.1 Surface Soil

The pH readings from the 20 hand auger soil samples collected in the local drainage area for Outfall 906 are shown on **Table 3** and depicted on **Figure 2**. Five of the samples exhibited pH values of less than 5.0 (HA-3 : 4.23 S.U., HA-4 : 4.43 S.U., HA-16 : 4.34 S.U., HA-17 : 4.93 S.U., and HA-20 : 4.32 S.U.), while the remaining 15 samples exhibited pH values ranging between 5.0 S.U. and 9.08 S.U.

Sample locations HA-3 and HA-4 were located in the area west of the road and north of the acetic acid tanks which is outside of the direct path of the 2003 spill. Sample locations HA-16, HA-17, and HA-20 were located in the elevated area at the convergence of the two roads south of the swale area. A small swale along the eastern side of this elevated area directs surface water via a buried drain pipe to the swale to the north where the acid was observed to have accumulated. No acid from the 2003 spill was observed in this area.

The hand auger borings advanced as part of this assessment were collected in areas outside of the estimated path of the 2003 spill and previous hand auger locations. In general, the pH values obtained from the hand auger locations as part of this assessment were higher than those obtained from the previous assessment. In 2003, 17 hand auger locations exhibited surficial soil pH values less than 5.0 S.U. Nearly all of the 2003 locations were sited within the estimated path of the former spill. However, the most recent data suggest that surface soils with pH values of less than 5.0 S.U. exist outside of the path of the former spill (see **Figure 2**).

5.1.2 Subsurface Soil

The pH readings obtained from the subsurface soil samples collected during installation of the six piezometers ranged from 4.46 S.U. and 10.24 S.U and are shown on **Table 2**. Specifically, the soil samples collected from the three most upgradient piezometer locations (G-2, C-2, and B-2) exhibited pH values ranging from 5.22 S.U. to 10.24 S.U. It should be noted; however, that lower pH values (<5.0 S.U.) were detected from 4 to 6 ft bgs and 6 to 8 ft bgs in the abandoned G-1 boring located immediately adjacent to the G-2 piezometer location. Given the fill material encountered in the subsurface, it is reasonable to expect a heterogeneous distribution of pH levels throughout the area.

Soil samples collected from each of the three downgradient piezometer locations (A-2, D-2, and E-2) exhibited pH readings less than 5.0 S.U. Piezometer D-2 exhibited low pH (<5.0 S.U.) readings at shallower sample depths (i.e., 0 to 8 ft bgs) as well as

in samples collected at greater depths (i.e., 10 to 20 ft bgs). Piezometers A-2 and E-2 exhibited low pH readings at depths ranging from 10 ft bgs to 20 ft bgs. The lower pH values existing in the deeper soil samples were detected at depth intervals above the observed water table in each of the borings as well as the elevation of the associated sewer line suggesting that this low pH soil may still be leaching during rain events and contributing to the low pH/elevated copper detected in the storm sewer outfall. The approximate water table levels observed at the time of piezometer installation in this area ranged from 10 to 24 ft bgs. The storm sewer system in the area of investigation is approximately 21 to 24 ft bgs, thereby intersecting the water table.

With the exception of piezometer E-2, all of the newly installed piezometers were sited in locations similar to the previous piezometers installed in 2003 (see **Figure 2**). In 2003, low pH values were observed in shallow soil samples collected from all of the upgradient piezometer locations located within the spill area. Shallow soil samples collected during this assessment did not exhibit low pH readings in any of the samples collected from the upgradient piezometer locations, indicating that the previous surficial application of soda ash in this area was effective in buffering the soil.

Low pH readings were obtained during this assessment in the three downgradient piezometer locations (A-2, D-2, and E-2). D-2 exhibited low pH values in shallow soil samples in addition to deeper samples; whereas A-2 and E-2 only exhibited low pH values at greater depths. The previous surficial soda ash application did not extend to the area where D-2 and E-2 are located.

5.2 GROUNDWATER PH RESULTS

5.2.1 August 17 and 20, 2007 Results

Groundwater pH readings obtained from the six newly installed piezometers on August 17 and 20, 2007 ranged from 5.40 S.U to 6.12 S.U. The average pH value was 5.85 S.U. Depth to water measurements ranged from 6.25 ft bgs to 23.52 ft bgs, with an average depth to water of 18.45 ft bgs. It should be noted that on August 16, 2007, 1.05 inches of rain was recorded at the site and between August 17 and 20, 2007, an additional 3.63 inches of rain was recorded. Each of the six piezometers were completed with varying heights of stick-up casing. Depth to water measurements from below top of casing (btoc) as well as the pH readings obtained from each piezometer are presented in **Table 1**.

5.2.2 September 28, 2007 Results

Groundwater pH readings were obtained from the six piezometers on September 28,

2007 following six days with no rain and ranged from 5.89 S.U. to 8.28 S.U. The average pH value was 6.44 S.U. The highest pH reading was obtained from the most upgradient piezometer (G-2) and the lowest pH reading was obtained from the most downgradient piezometer (E-2). Depth to water measurements ranged from 9.04 ft bgs to 23.55 ft bgs, with an average depth to water of 18.63 ft bgs. Depth to water measurements from below top of casing as well as the pH readings obtained from each piezometer are presented in **Table 1**.

The pH readings recorded in September 2007 were generally consistent with the pH readings collected in August 2007 with the exception of G-2 which exhibited a pH value of 5.40 S.U. on August 17, 2007 and a pH value of 8.28 S.U. on September 28, 2007. As stated previously, the August 17, 2007 pH readings were obtained following 1.05 inches of rain, therefore it is possible that the lower pH value observed at G-2 at that time was a result of the leaching of residual acid following the rain event.

A summary of the pH results from both sampling events is presented in **Table 1** and shown on **Figures 2 & 3**.

5.3 GROUNDWATER ANALYTICAL RESULTS

The groundwater samples collected from A-2, B-2, C-2, D-2, E-2, and G-2 on September 28, 2007 exhibited concentrations of dissolved copper, nickel, and zinc above the laboratory reporting limits (RLs). Dissolved silver was not detected above the RL in any of the piezometers sampled.

Dissolved zinc results ranged from non-detect to 0.072 mg/L, with the highest concentration being detected at A-2. Dissolved nickel results ranged from non-detect to 0.010 mg/L, with the highest concentration detected at C-2. Dissolved copper results ranged from 0.003 mg/L at the most upgradient piezometer in the spill area (G-2) to 0.045 mg/L at the most downgradient piezometer (E-2). These data suggest that additional infiltration through the area has resulted in the dissolution and mobilization of dissolved copper to the sewer.

A summary of the groundwater analytical results is presented in **Table 4** and the full analytical laboratory report is included as **Attachment B**. In addition, a line graph depicting the relationship between pH values and dissolved copper concentrations for the collected groundwater samples is presented in **Graph 1**. The graph illustrates the inverse relationship between the two variables and shows that as the observed pH values generally decreased from upgradient to downgradient, dissolved copper concentrations increased.

6.0 *ADDITIONAL SURFACE WATER SAMPLING*

On August 17 and September 28, 2007, Hercules personnel obtained surface water samples from six additional locations in proximity to the former spill area and Outfall 906. These locations included two storm sewer manholes located within the observed spill area ("AG2 MH" and "AD2 MH"), two discharge pipes located immediately downgradient of the piezometers ("AEOP" and "AEOPN"), and two locations ("A004" and "ASW004") located further downstream towards Outfall 006 (906). Hercules collected pH readings from each of the sample locations and submitted aqueous samples to Universal for the analysis of zinc, copper, silver, and nickel.

6.1 *SURFACE WATER PH RESULTS*

The pH results obtained by Hercules on August 17, 2007 ranged between 6.6 S.U. and 7.8 S.U., with the lowest pH value (6.6 S.U.) detected at discharge pipe "AEOPN" located downgradient of piezometer E-2. As noted previously, these results were obtained during or shortly after a rain event.

The pH results obtained by Hercules on September 28, 2007 ranged between 6.3 S.U. and 8.2 S.U., with the lowest pH value (6.3 S.U.) again detected at "AEOPN" and the highest pH value (8.2 S.U.) at the most upgradient manhole location, "AG2 MH".

The pH values obtained by Hercules from each sample location are presented in **Table 5**.

6.2 *SURFACE WATER ANALYTICAL RESULTS*

6.2.1 *August 17, 2007 Analytical Results*

The surface water samples collected from the six sampling locations on August 17, 2007 exhibited concentrations of dissolved nickel and zinc above the laboratory RLs. The detected nickel results ranged from 0.050 mg/L to 0.063 mg/L with the highest concentrations detected at the two most upgradient sampling locations ("AG2 MH" and "AD2 MH") and one location located further downstream towards Outfall 906 ("A004").

The detected zinc results ranged from 0.027 mg/L to 0.086 mg/L with the highest concentrations detected again at the two most upgradient sampling locations ("AG2 MH" and "AD2 MH") in addition to one of the discharge pipes ("AEOPN") located downgradient of the piezometers.

Dissolved copper and silver were not detected above their respective RLs in any of the samples collected. As stated previously, the samples collected on this date were

collected after a total of 1.05 inches of rain was recorded at the site on August 16, 2007. The additional flow in the sewer as a result of the rain event appears to have "buffered" the pH values and diluted stream such that the dissolved copper concentrations were below detectable limits. However, elevated zinc concentrations were detected in the two most upgradient locations after the rain event, indicating possible influence from an upgradient location.

The surface water analytical results provided by Hercules are presented in **Table 5**.

6.2.3 September 28, 2007 Analytical Results

The surface water samples collected from the six sampling locations on September 28, 2007 exhibited concentrations of dissolved copper, nickel, and zinc above the laboratory RLs. The detected copper results ranged from 0.002 mg/L to 0.010 mg/L with the highest concentration detected at the upgradient "AD2 MH" location followed by "AEOPN" and "A004", located further downgradient. It is interesting to note that, with the exception of manhole "AD2 MH", the copper concentrations only varied by 0.0005 mg/L between the upgradient and downgradient manhole samples. Dissolved nickel was detected at two downgradient locations ("AEOPN" and "A004") at a concentration of 0.01 mg/L.

The detected zinc results ranged from 0.007 mg/L to 0.33 mg/L with the highest concentrations detected at one of the downgradient discharge pipes ("AEOPN") and the two manhole locations, "AG2 MH" and "AD2 MH", closest to piezometers G-2 and D-2, respectively. Dissolved silver was not detected above the RL in any of the samples collected. As stated previously, the samples collected on this date were collected after a dry period of six days.

The surface water analytical results provided by Hercules are presented in **Table 5**.

The rain event in August appeared to dilute the dissolved copper concentrations in the area of the former spill. However, as stated previously, elevated nickel and zinc concentrations were detected at the two most upgradient locations indicating possible effects from an upgradient area following a rain event. The results obtained in September exhibited dissolved copper concentrations with somewhat lower nickel and zinc concentrations.

7.0 CONCLUSIONS

The findings of this additional assessment corroborate the initial data collected in 2003 and indicate that the source of low pH/elevated copper detected in Outfall 906 may be a result of the dissolution of copper and other inorganic compounds from surface/subsurface soil and fill and the presence of residual acetic acid. In comparison, the subsurface soil pH data collected from borings in August 2007 were generally higher (closer to neutral pH) than the 2003 data in the swale area to the northeast of the road. Conversely, the pH of the soil in boring D-2, which is situated to the southeast of the spill area and adjacent to the unloading area, exhibited pH values less than 5.0 S.U. down to 18 ft bgs.

These data suggest that the subsurface soil along the swale (where the acid seemed to have accumulated) appears to have been buffered by the previous surficial application of soda ash; however, due to the heterogeneous nature of the subsurface material (fill), the presence of pockets of residual acid cannot be discounted. It should be noted as well that the application was limited to the northwestern side of the roadway and did not extend across the road to the area surrounding D-2. In addition, surficial soil pH data collected from hand auger boring locations revealed areas of relatively low pH to the north and east of the previous spill area, which drain to the Outfall 906 as well.

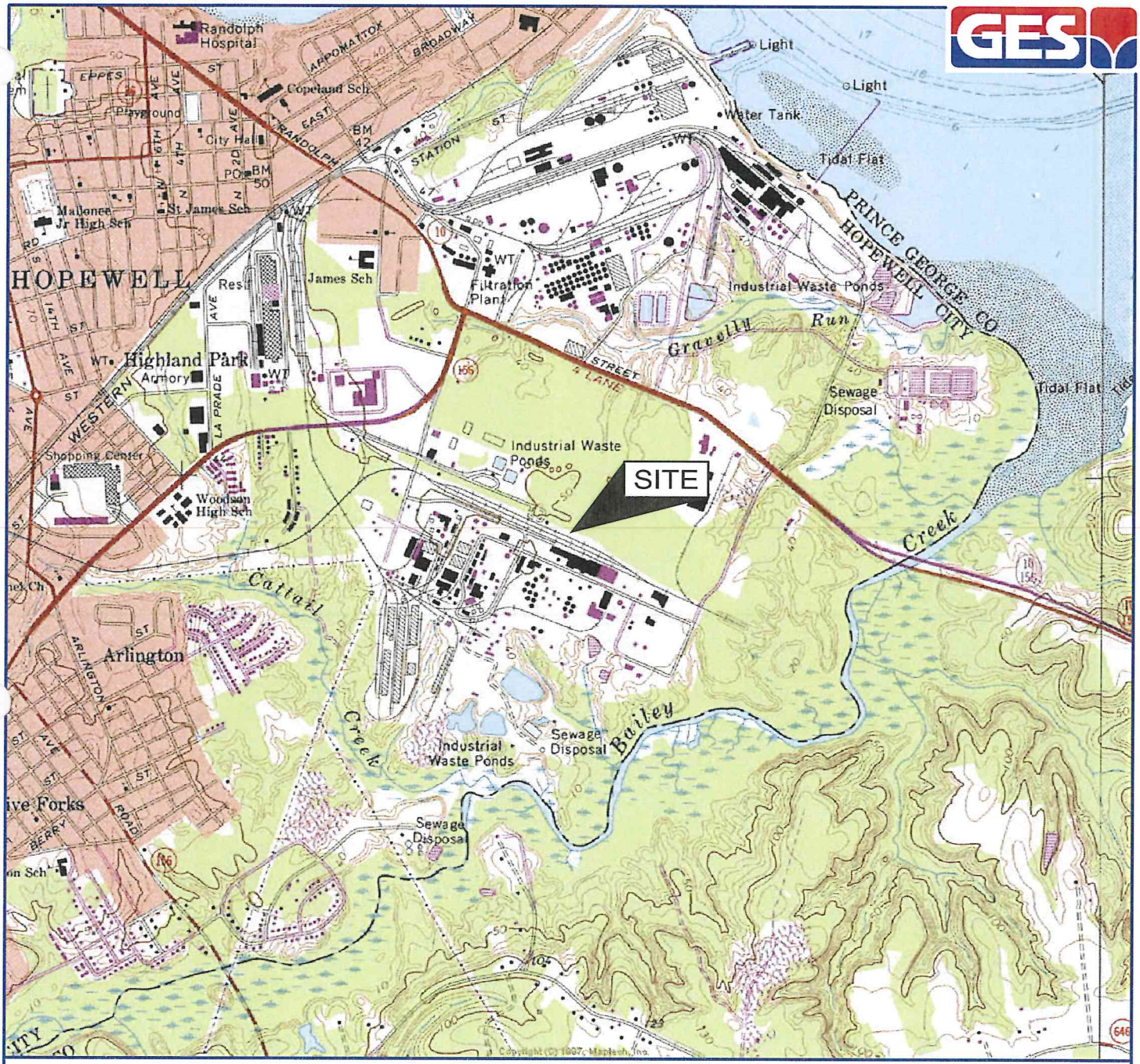
The groundwater data obtained as part of this assessment exhibited pH readings ranging from 5.40 to 8.28 S.U.s; however, these values are still somewhat lower overall when compared to the surface water pH results obtained by Hercules. In addition, the dissolution of various inorganic compounds, namely copper and zinc have resulted in compliance issues for Hercules at Outfall 906. The observed concentrations of these inorganic compounds in the piezometers located downgradient of the spill area and closest to Outfall 906 are an order of magnitude higher than what was measured in the piezometers located at the most upgradient area of the swale.

The application of soda ash in the area of the 2003 spill appeared to have a positive and long-lasting effect on the distribution of lower pH soil concentrations in the observed path of the spill. However, it does appear that there are areas outside of the spill path and treatment area that still exhibit lower (<5.0 S.U.) pH concentrations. These areas are situated to the north and east for surface soils and adjacent to boring D-2 for subsurface soils and should be targeted for additional treatment.

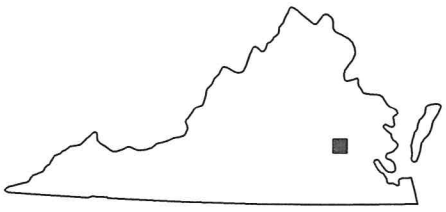
The recommended treatment for the affected area includes additional surficial application of soda ash in the area of the spill (i.e., along the drainage swale) on a bimonthly basis until groundwater pH levels are consistently observed at pH levels close to 7.0 S.U. Based on calculations prepared by Hercules, it is estimated that one pallet (equivalent to approximately 2,500 pounds) of soda ash applied to the former spill area every other month should be sufficient to buffer the residual acid in the area. In order to measure the efficacy of the soda ash application, groundwater

quality should be monitored in the six existing wells monthly as well as following any significant rain event (i.e., $\geq$ 2 inches). Once the pH levels have returned to near neutral, the bimonthly application of soda ash may be reduced or discontinued.

Figures



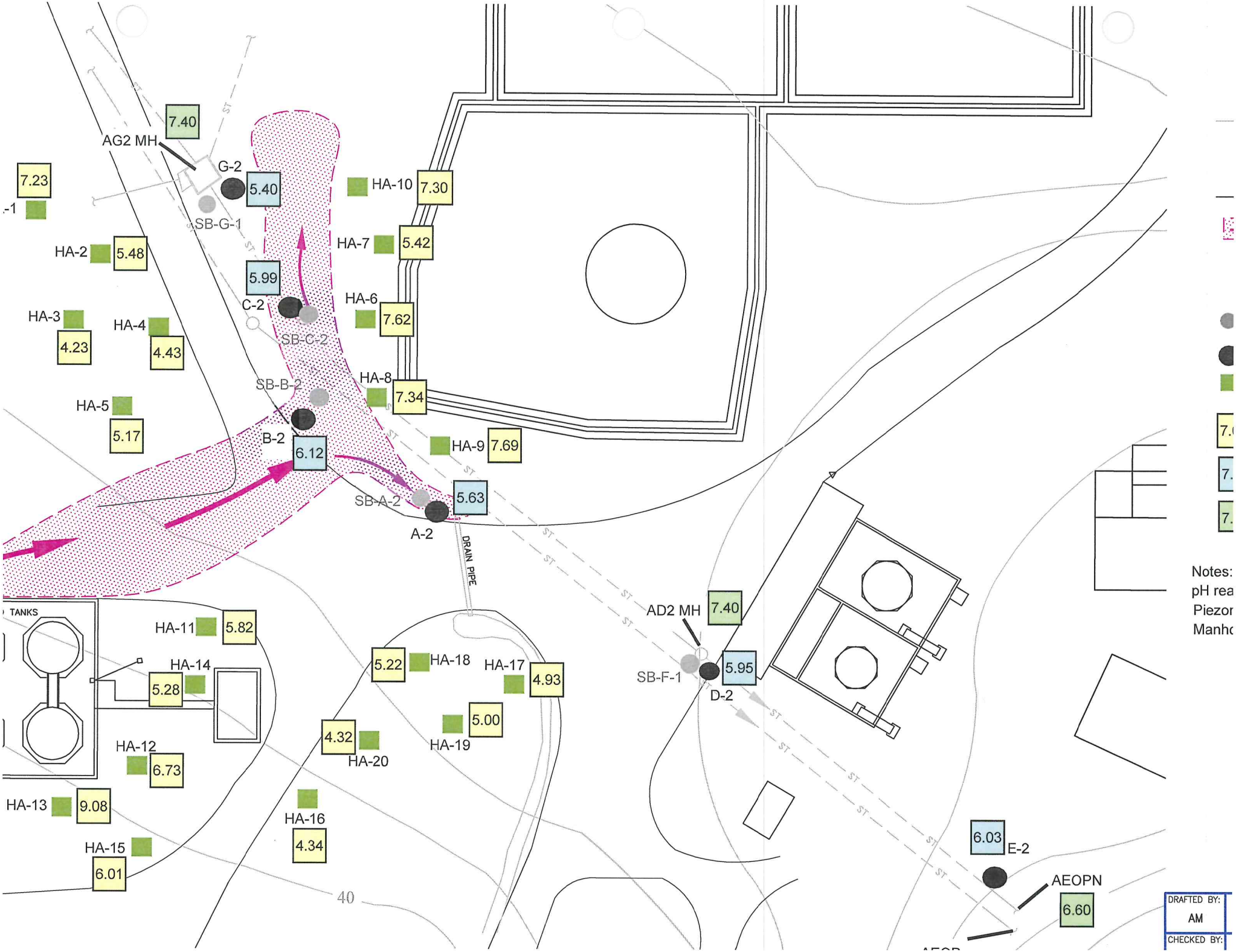
SOURCE: USGS 7.5 MINUTE SERIES
TOPOGRAPHIC QUADRANGLE 1987
HOPEWELL, VIRGINIA
CONTOUR INTERVAL = 10'

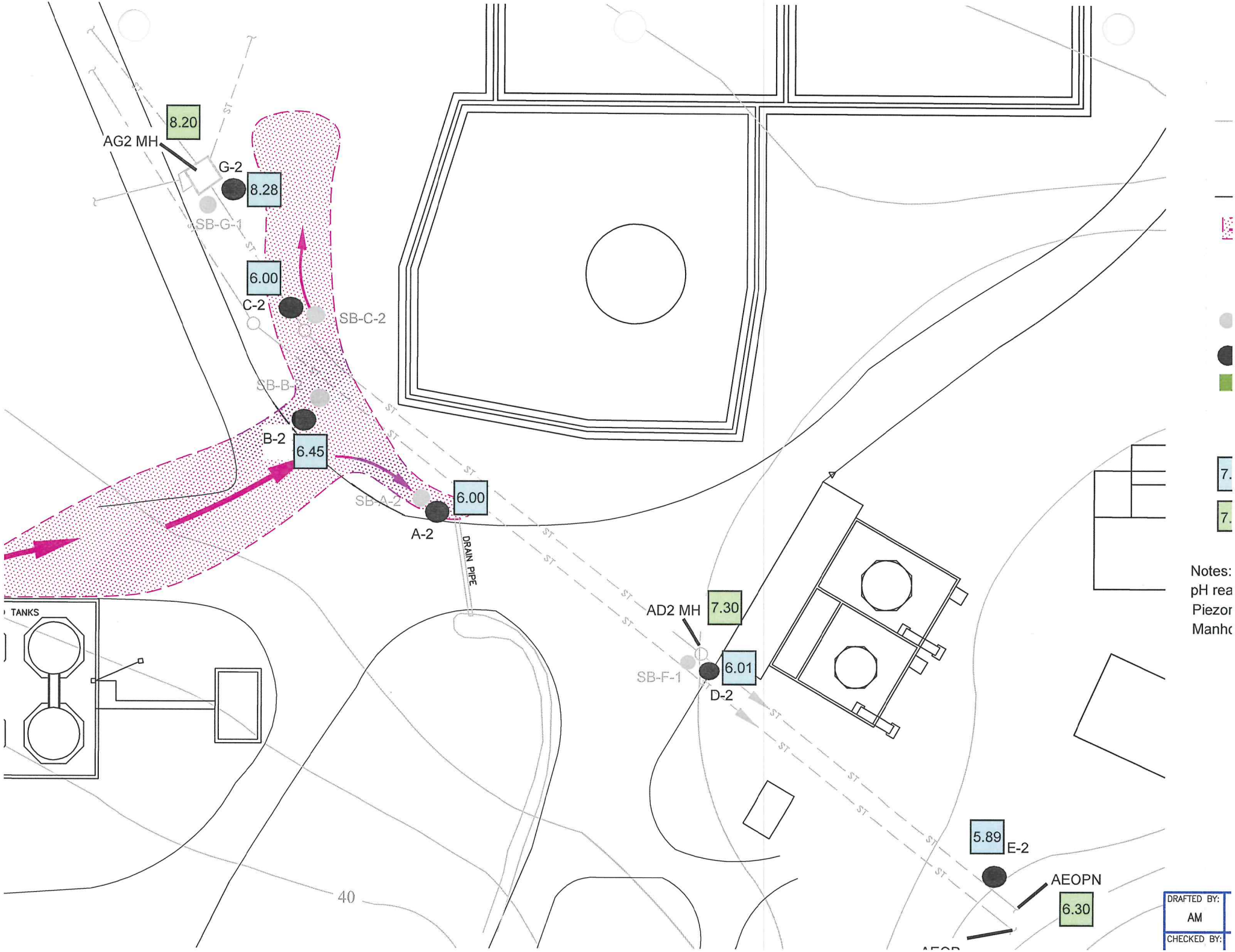


QUADRANGLE LOCATION
LAT. 037° 17' 19.86" N
LONG. 077° 16' 37.63" W
(APPROXIMATE SITE COORDINATES)

DRAFTED BY: W.A.W. (N.J.)	SITE LOCATION MAP
CHECKED BY:	HERCULES INCORPORATED AQUALON DIVISION HOPEWELL, VIRGINIA
REVIEWED BY:	
NORTH	Groundwater & Environmental Services, Inc. 23 SOUTH 13th STREET, SUITE 201, RICHMOND, VA 23219

SCALE IN FEET	DATE	FIGURE
0 2000	10-26-07	1


7.40
AG2 MH
7.23
G-2
5.40
SB-G-1
HA-10
7.30
HA-7
5.42
HA-2
5.48
5.99
C-2
HA-6
7.62
HA-3
4.23
HA-4
4.43
SB-C-2
HA-8
7.34
SB-B-2
HA-5
5.17
B-2
6.12
HA-9
7.69
SB-A-2
5.63
A-2
DRAIN PIPE
ST
TANKS
HA-11
5.82
HA-14
5.28
5.22
HA-18
HA-17
4.93
HA-12
6.73
4.32
HA-20
5.00
HA-19
HA-13
9.08
HA-16
4.34
HA-15
6.01
40
AD2 MH
7.40
SB-F-1
5.95
D-2
6.03
E-2
AEOPN
6.60
Notes:
pH rea
Piezor
Manhc
DRAFTED BY:
AM
CHECKED BY:


8.20
AG2 MH
G-2
8.28
SB-G-1
6.00
C-2
SB-C-2
SB-B-1
B-2
6.45
SB-A-2
6.00
A-2
DRAIN PIPE
TANKS
AD2 MH
7.30
SB-F-1
6.01
D-2
5.89
E-2
AEOPN
6.30
ST
40
DRAFTED BY:
AM
CHECKED BY:
Notes:
pH rea
Piezor
Manhc

Tables

Table 1
Hercules - Aqualon
Outfall 906 Discharge Assessment
Summary of Piezometer Field Measurements and Water Quality Parameters

Piezometer No.	Total Depth (ft bgs)	Screen Interval (ft bgs)	Initial Water Level (ft btoc)	Initial Water Level (ft bgs)	Date	pH (SU)	Temperature (°C)	Conductivity 1 (µs/cm[c])	Conductivity 2 (µs/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)
G-2	24	24-14	8.60	7.50	8/17/07	5.40	25.88	210	212	0.67	71.5
			17.35	16.25	9/28/07	8.28	26.52	NA	3290	5.32	-226.0
C-2	21	21-11	9.75	6.25	8/20/07	5.99	25.54	349	352	1.52	-59.1
			12.01	9.04	9/28/07	6.00	30.04	NA	181	8.42	6
B-2	27	27-17	24.00	23.40	8/17/07	6.12	26.19	2121	2167	0.44	-108.8
			24.05	23.40	9/28/07	6.45	25.35	NA	3150	9.54	-118
A-2	28	28-18	23.90	23.52	8/17/07	5.63	25.89	4364	4437	3.73	-26.4
			23.90	23.55	9/28/07	6.00	24.21	NA	4690	11.17	-20
D-2	28	28-18	23.10	21.50	8/17/07	5.95	26.38	1740	1742	1.91	-104.9
			23.17	21.45	9/28/07	6.01	23.76	NA	380	9.45	-78
E-2	28	28-18	19.91	18.31	8/17/07	6.03	24.7	1740	1730	4.8	-82.3
			19.95	18.10	9/28/07	5.89	24.52	NA	749	7.43	-81

Notes:
August sampling took place following a rain event (1.05 inches on 8/16/07)
September sampling took place following a dry period of six days

bgs = below ground surface
btoc = below top of casing
cm = centimeters
ft = feet
L = liters
mg = milligrams
mV = millivolts
µs = microsiemens
SU = standard units
°C = degrees Celsius

Table 2
Hercules - Aqualon
Outfall 906 Discharge Assessment
Summary of Soil Boring pH Results

Depth (ft bgs)	SB-G-1 (March 2003) pH (S.U)	G-1 (abandoned) pH (S.U)	G-2 pH (S.U)	SB-C-2 (March 2003) pH (S.U)	C-2 pH (S.U)	SB-B-2 (March 2003) pH (S.U)	B-2 pH (S.U)	SB-A-2 (March 2003) pH (S.U)	A-2 pH (S.U)	SB-F-1 (March 2003) pH (S.U)	D-2 pH (S.U)	E-2 pH (S.U)
0-2	3.18	5.30	6.99	NR	6.88	3.48	6.88	5.63	5.54	6.49	4.72	8.71
2-4	3.44	5.30	5.57	2.99		3.29	6.41	2.92	7.08	6.06		5.79
4-6	3.59	4.69	5.86	3.53	8.61	NR	6.30	3.54	7.47	6.07	4.98	8.05
6-8	3.97	4.65	5.50	3.26	6.20	3.09	5.97	5.23	7.71	5.40		6.67
8-10	3.49	6.21	5.63	3.44	7.13	4.24	5.22	8.64	6.70	5.76	6.86	6.68
10-12	4.73	9.49	7.77	6.14	7.97	7.01	6.82	7.66	7.15	5.97		4.46
12-14	3.51	6.80	6.65	5.99	8.01	7.01	7.72	5.05	7.46	5.97	4.78	5.83
14-16	5.17	7.07	8.77	7.78	7.38	7.95		7.44	8.44	5.85		6.03
16-18	3.50	NS	6.72	7.80	7.26	6.48	6.93	7.17	4.77	5.93	4.78	6.66
18-20	9.64	NS	8.79	7.32	6.88	6.15	8.49	5.65	4.82	4.78	5.47	6.75
20-22	8.45	NS	9.67	8.16	7.96	6.61	5.55	4.90	5.86	6.30	6.11	6.94
22-24	7.86	NS	10.24	6.80	NS	5.81	7.35	4.69	6.29	6.79	5.97	6.86
24-26	6.97	NS	NS	6.35	NS	7.02	6.62	NS	5.81	NS	6.86	5.70
26-28	6.24	NS	NS	NS	NS	6.03	6.72	NS	5.97	NS	5.86	

Notes:
G-1 abandoned due to refusal at 16 ft bgs.
ft bgs = feet below ground surface
NS = Not Sampled
S.U. = standard units
pH < 5
= approximate observed water level

Table 3
Hercules - Aqualon
Outfall 906 Discharge Assessment
Summary of Hand Auger Boring pH Results

Area	Location	pH (S.U.)
West of Storm Sewer Manway	HA-1	7.23
	HA-2	5.48
	HA-3	4.23
	HA-4	4.43
	HA-5	5.17
East of Swale	HA-6	7.62
	HA-7	5.42
	HA-8	7.34
	HA-9	7.69
	HA-10	7.30
East and South of Acetic Acid Tanks	HA-11	5.82
	HA-12	6.73
	HA-13	9.08
	HA-14	5.28
	HA-15	6.01
Grassy Area to the South of Swale/East of Acetic Acid Tanks	HA-16	4.34
	HA-17	4.93
	HA-18	5.22
	HA-19	5.00
	HA-20	4.32

Notes:
S.U. = standard units

Table 4
Hercules - Aqualon
Outfall 906 Discharge Assessment
Summary of Groundwater Sampling Analytical Results

Location	Sampling Date	pH (S.U.)	Dissolved Metals (mg/L)			
			Cu	Ni	Zn	Ag
G-2	9/28/2007	8.28	0.003	<.005	0.009	<.00005
C-2	9/28/2007	6.00	0.007	0.01	0.025	<.00005
B-2	9/28/2007	6.45	0.006	0.001	0.009	<.00005
A-2	9/28/2007	6.00	0.01	0.006	0.072	<.00005
D-2	9/28/2007	6.01	0.012	0.005	0.012	<.00005
E-2	9/28/2007	5.89	0.045	<.005	<.005	<.00005

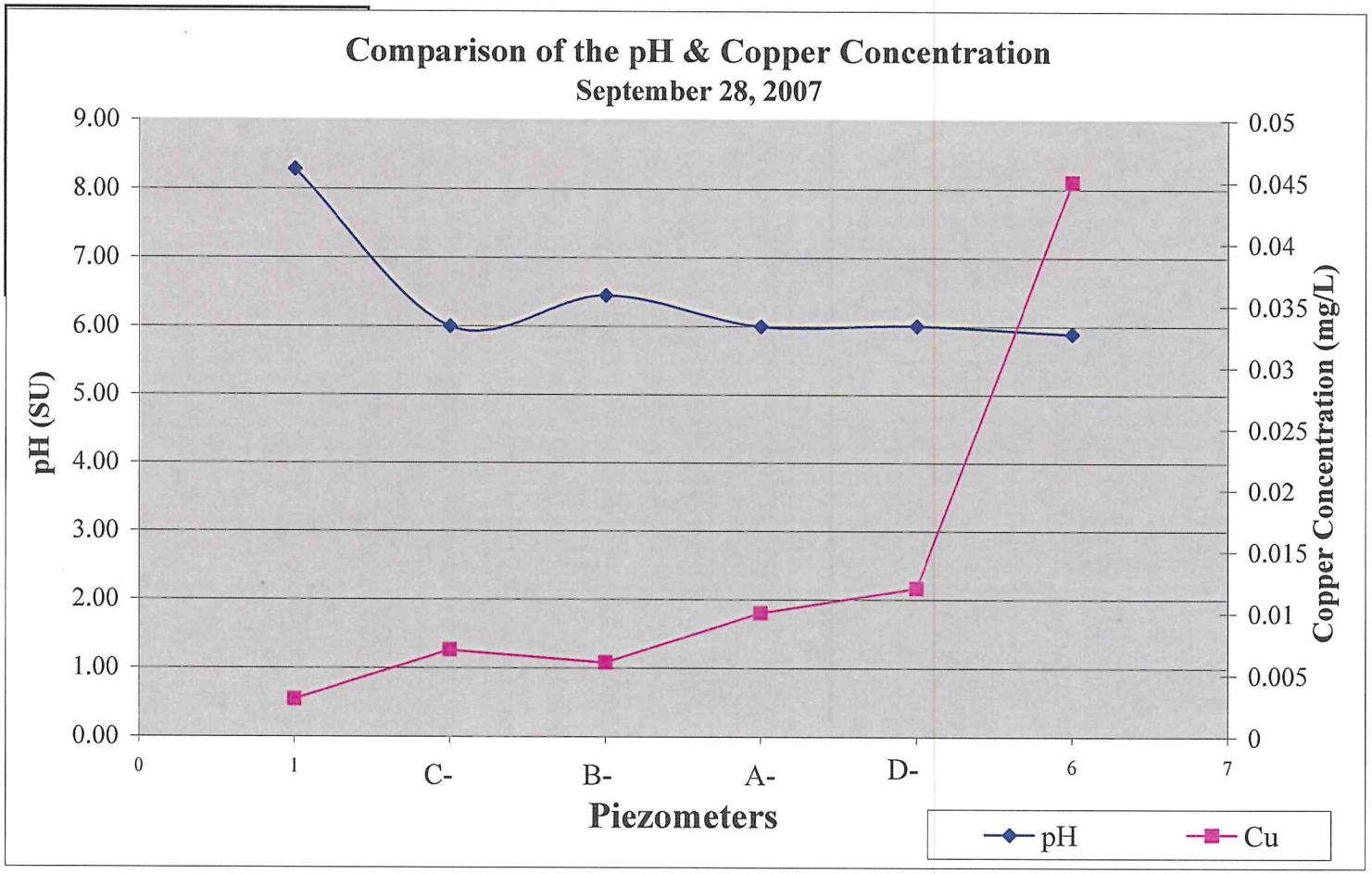
Notes:
S.U. = Standard Units
mg/L = milligrams per liter

Table 5
Hercules - Aqualon
Outfall 906 Discharge Assessment
Summary of Surface Water Analytical Results

Location	Sampling Date	pH (S.U.)	Dissolved Metals mg/L			
			Cu	Ni	Zn	Ag
AG2 MH	8/17/2007	7.4	<.003	0.062	0.075	<.005
	9/28/2007	8.2	0.002	<.005	0.031	<.005
AD2 MH	8/17/2007	7.4	<.003	0.063	0.086	<.005
	9/28/2007	7.3	0.01	<.005	0.032	<.005
AEOP	8/17/2007	7.2	<.003	0.05	0.027	<.005
	9/28/2007	6.9	0.003	<.005	0.012	<.005
AEOPN	8/17/2007	6.6	<.003	<.006	0.056	<.005
	9/28/2007	6.3	0.007	0.01	0.033	<.005
AOO4	8/17/2007	7.3	<.003	0.062	0.028	<.005
	9/28/2007	7.0	0.005	0.01	0.019	<.005
ASW004	8/17/2007	7.8	<.003	0.053	<.005	<.005
	9/28/2007	8.0	0.003	<.005	0.007	<.005

Notes:
All samples collected by Hercules personnel
S.U. = Standard Units
mg/L = milligrams per liter

Graphs


Comparison of the pH & Copper Concentration
September 28, 2007
pH (SU)
Copper Concentration (mg/L)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0
1
C-
B-
A-
D-
6
7
Piezometers
pH
Cu

ATTACHMENT A

Boring Logs and Piezometer Construction Information

Soil Boring Log

Well ID: G-2

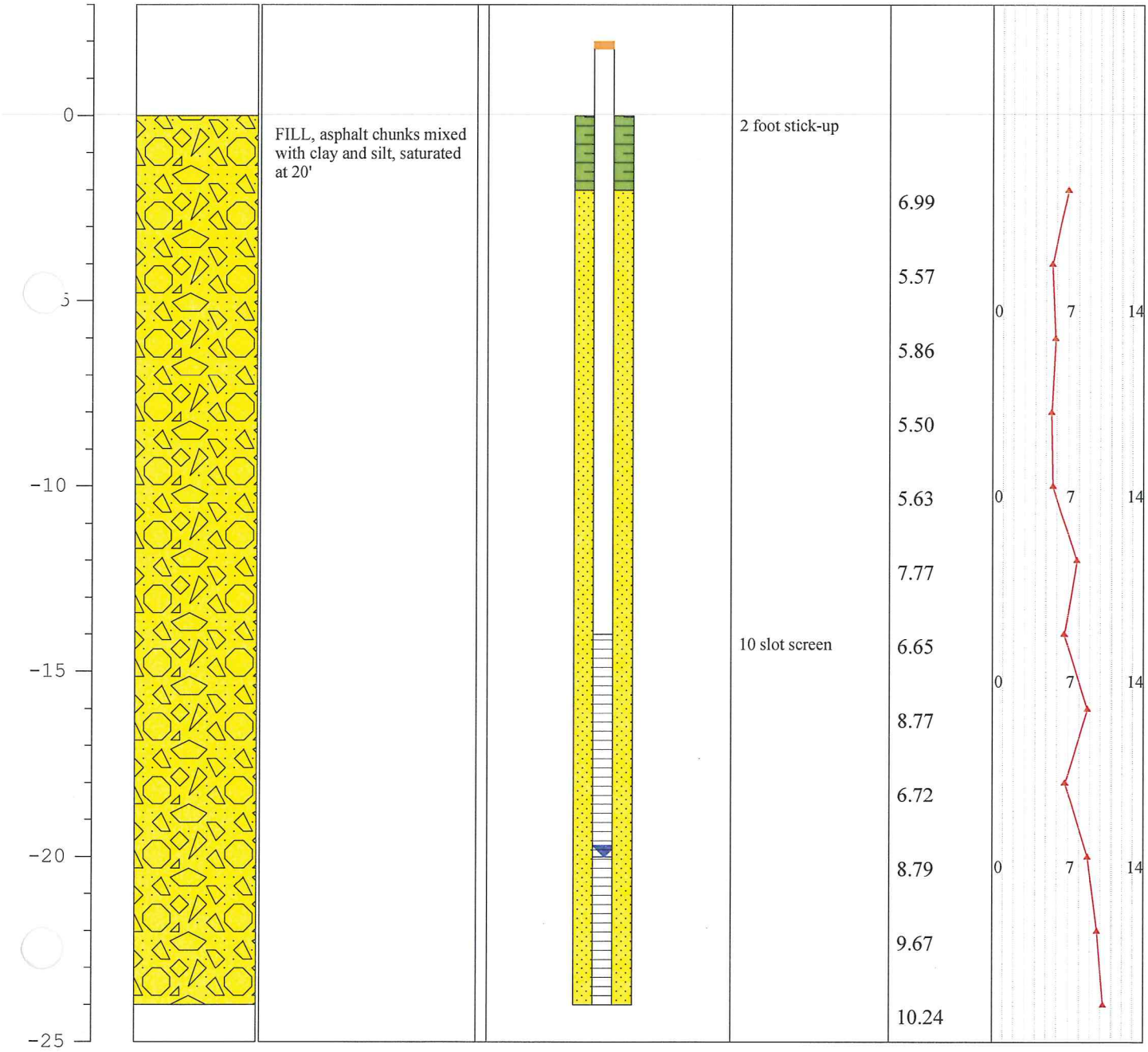
PROJECT INFORMATION

ROJECT:	**Hercules Aqualon**
IT CATION:	**Hopewell, Virginia**
OB NUMBER:	**1201057**
OGGED BY:	**Tim Davis**
ROJECT MANAGER:	**Monty Bennett**
ATES DRILLED:	**8/16/2007**
/ELL ID	**G-2**

DRILLING INFORMATION

DRILLER:	**Louis LeFever**
BORING DEPTH:	**24 feet**
DRILLING CO.:	**Parratt-Wolff**
RIG TYPE:	**Power Probe 9600T**
METHOD OF DRILLING:	**2 inch push**
SAMPLING METHODS:	**4 foot Macro**

VERTICAL DEPTH	SOIL/ROCK SYMBOLS	SOIL DESCRIPTION	WELL CONSTRUCTION	NOTES	pH
0		FILL, asphalt chunks mixed with clay and silt, saturated at 20'		2 foot stick-up	6.99
-5					5.57
					5.86
					5.50
-10					5.63
					7.77
-15				10 slot screen	6.65
					8.77
					6.72
-20					8.79
					9.67
-25					10.24



Soil Boring Log

Well ID: C-2

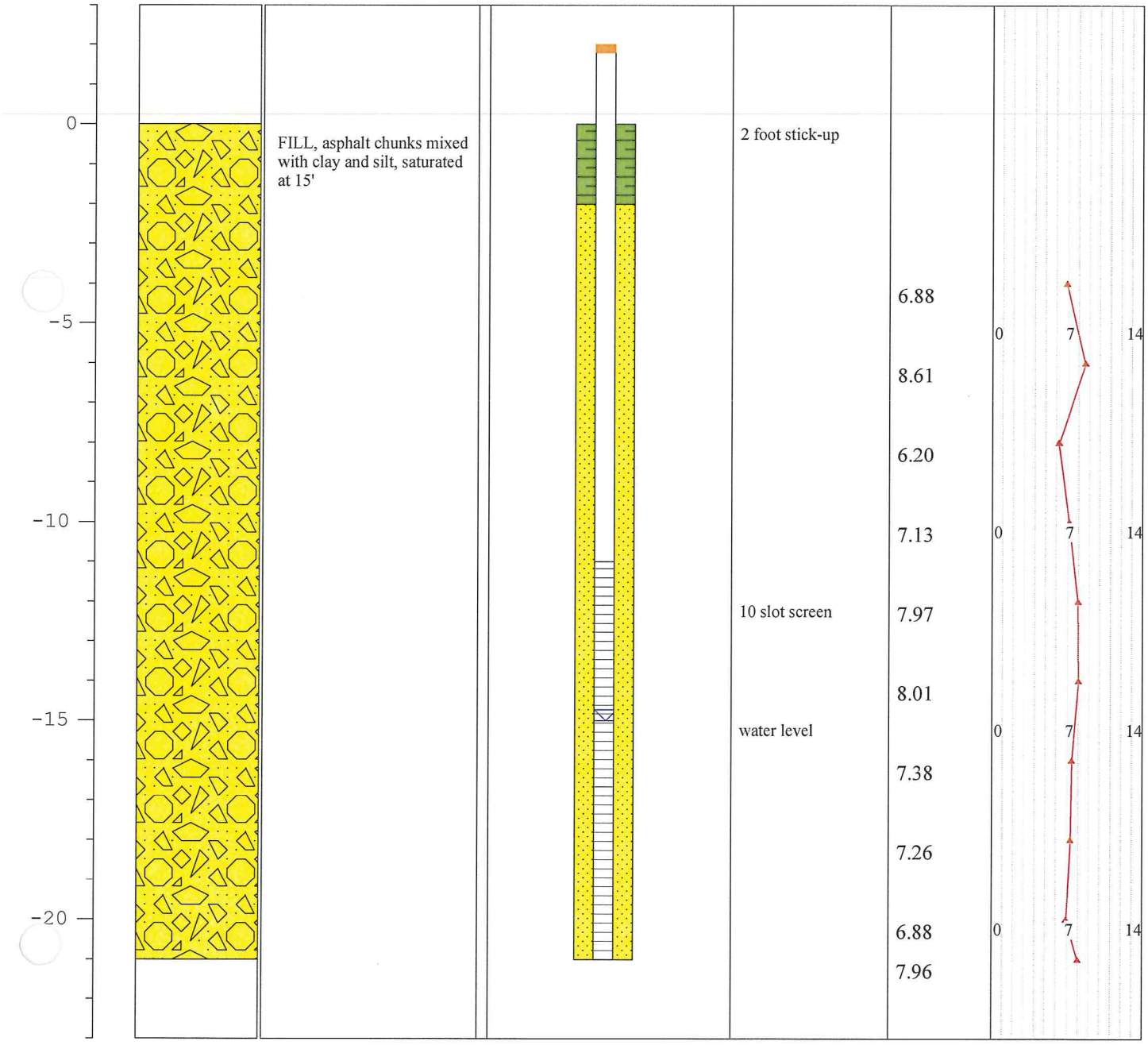
PROJECT INFORMATION

ROJECT:	**Hercules Aqualon**
I: OCATION:	**Hopewell, Virginia**
OB NUMBER:	**1201057**
OGGED BY:	**Tim Davis**
ROJECT MANAGER:	**Monty Bennett**
ATES DRILLED:	**8/16/2007**
/ELL ID	**C-2**

DRILLING INFORMATION

DRILLER:	**Louis LeFever**
BORING DEPTH:	**21 feet**
DRILLING CO.:	**Parratt-Wolff**
RIG TYPE:	**Power Probe 9600T**
METHOD OF DRILLING:	**2 inch push**
SAMPLING METHODS:	**4 foot Macro**

VERTICAL DEPTH	SOIL/ROCK SYMBOLS	SOIL DESCRIPTION	WELL CONSTRUCTION	NOTES	pH
0		FILL, asphalt chunks mixed with clay and silt, saturated at 15'		2 foot stick-up	6.88
-5					8.61
					6.20
-10					7.13
				10 slot screen	7.97
					8.01
-15				water level	
					7.38
					7.26
-20					6.88
					7.96



Soil Boring Log

Well ID: B-2

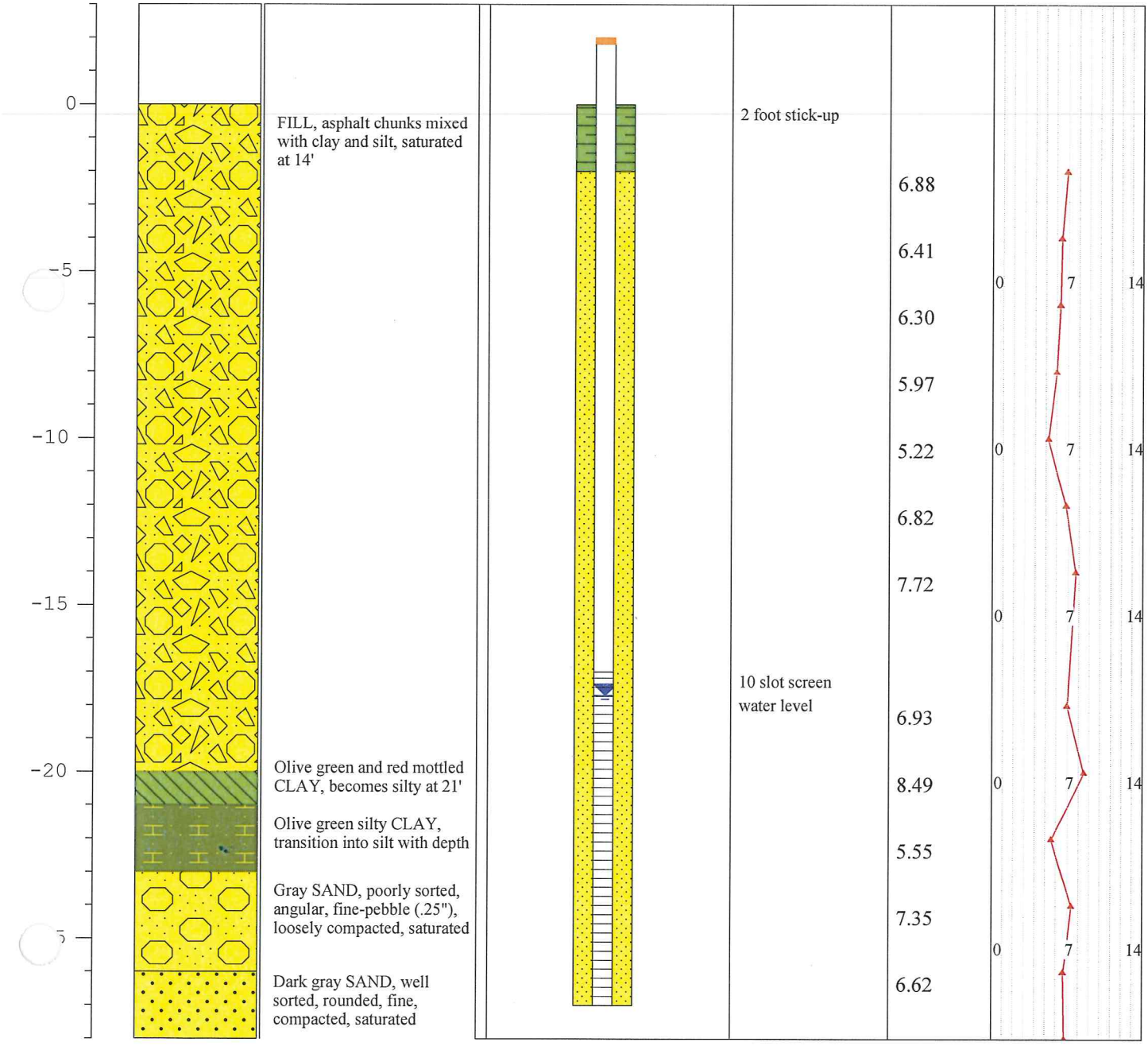
PROJECT INFORMATION

ROJECT:	**Hercules Aqualon**
IT CATION:	**Hopewell, Virginia**
OB NUMBER:	**1201057**
OGGED BY:	**Tim Davis**
ROJECT MANAGER:	**Monty Bennett**
ATES DRILLED:	**8/16/2007**
/ELL ID	**B-2**

DRILLING INFORMATION

DRILLER:	**Louis LeFever**
BORING DEPTH:	**27 feet**
DRILLING CO.:	**Parratt-Wolff**
RIG TYPE:	**Power Probe 9600T**
METHOD OF DRILLING:	**2 inch push**
SAMPLING METHODS:	**4 foot Macro**

VERTICAL DEPTH	SOIL/ROCK SYMBOLS	SOIL DESCRIPTION	WELL CONSTRUCTION	NOTES	pH



Soil Boring Log

Well ID: A-2

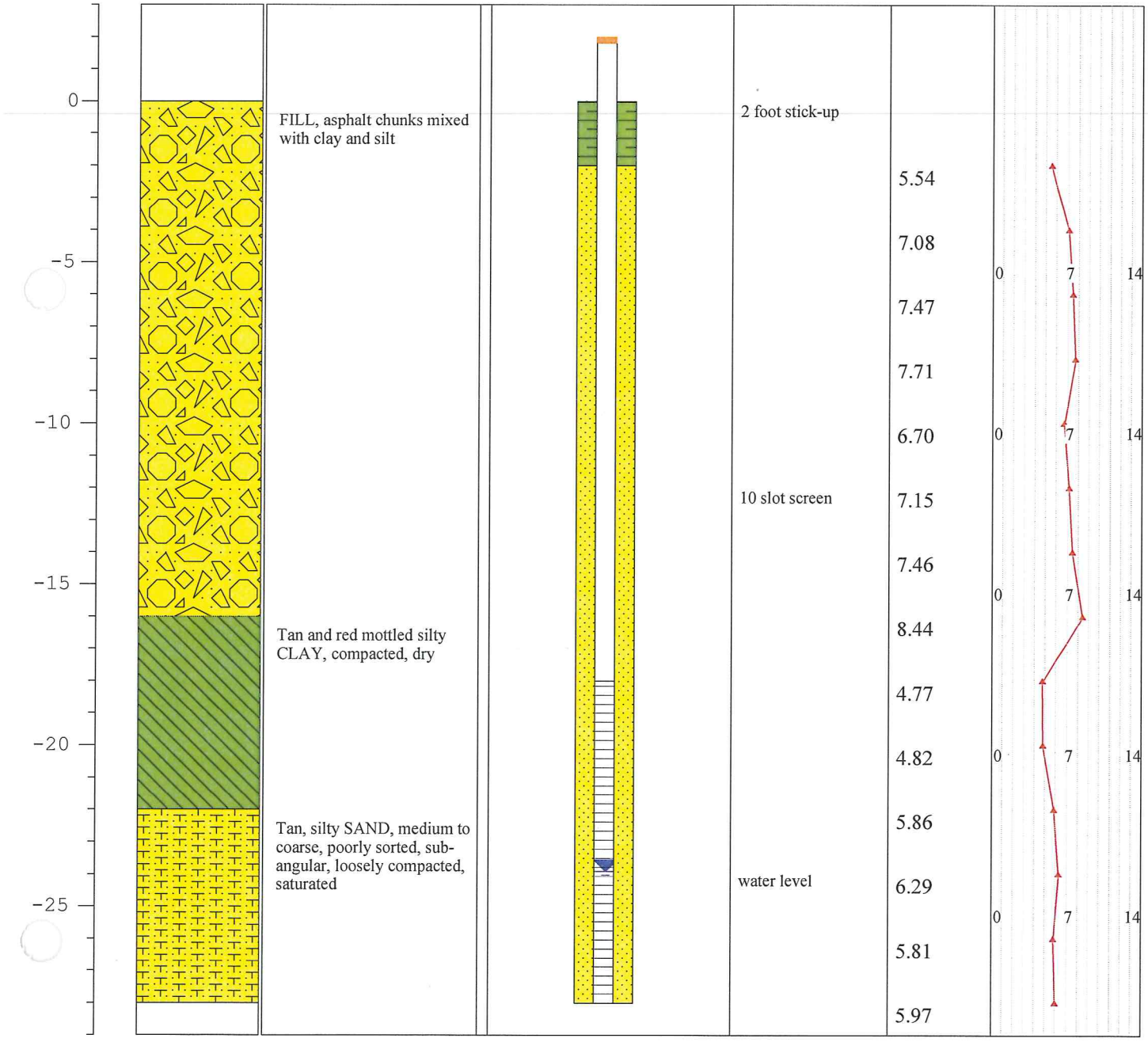
PROJECT INFORMATION

ROJECT:	**Hercules Aqualon**
I: OCATION:	**Hopewell, Virginia**
OB NUMBER:	**1201057**
OGGED BY:	**Tim Davis**
ROJECT MANAGER:	**Monty Bennett**
ATES DRILLED:	**8/17/2007**
/ELL ID	**A-2**

DRILLING INFORMATION

DRILLER:	**Louis LeFever**
BORING DEPTH:	**28 feet**
DRILLING CO.:	**Parratt-Wolff**
RIG TYPE:	**Power Probe 9600T**
METHOD OF DRILLING:	**2 inch push**
SAMPLING METHODS:	**4 foot Macro**

VERTICAL DEPTH	SOIL/ROCK SYMBOLS	SOIL DESCRIPTION	WELL CONSTRUCTION	NOTES	pH



Soil Boring Log

Well ID: D-2

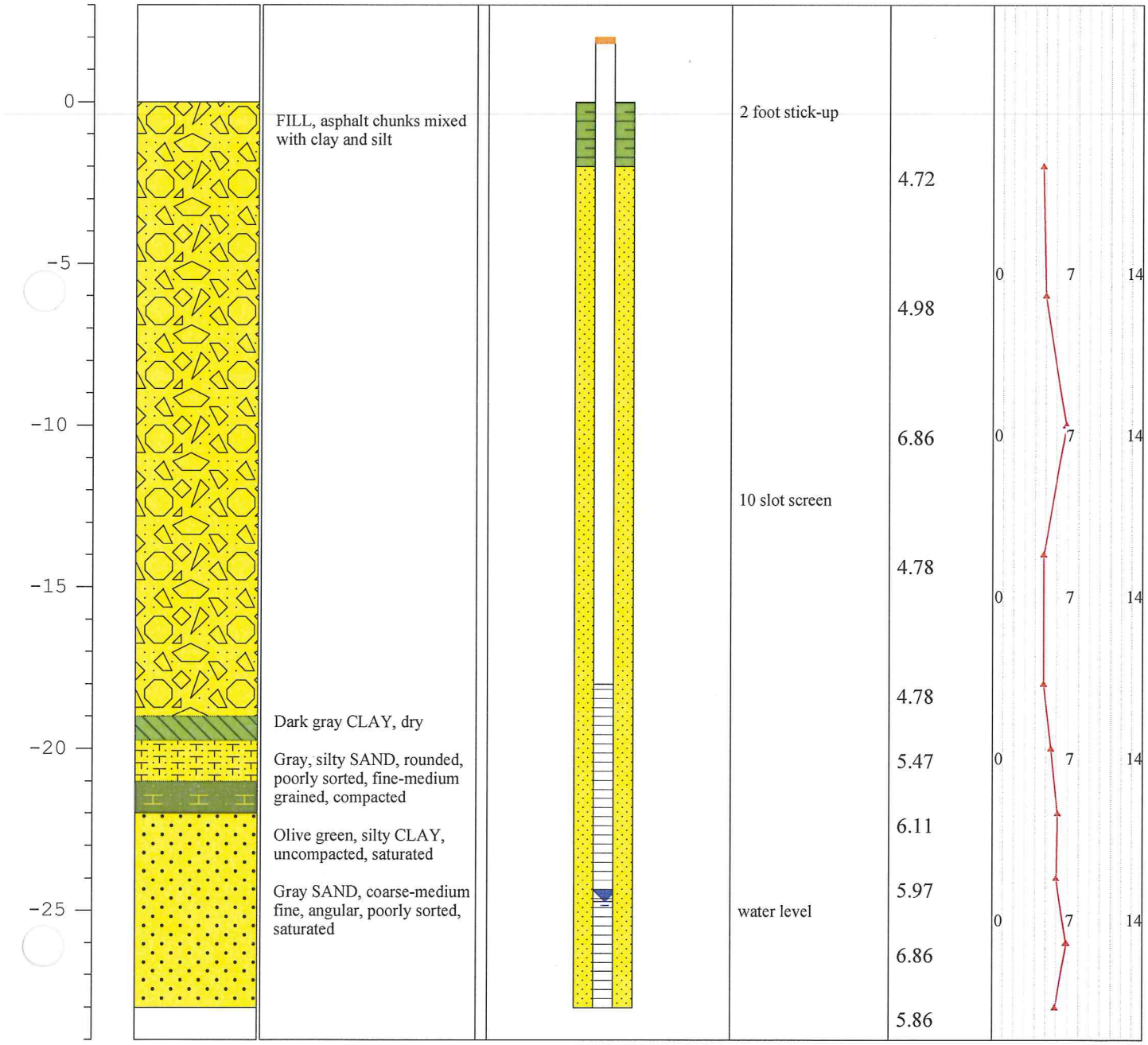
PROJECT INFORMATION

ROJECT:	**Hercules Aqualon**
IT CATION:	**Hopewell, Virginia**
OB NUMBER:	**1201057**
OGGED BY:	**Tim Davis**
ROJECT MANAGER:	**Monty Bennett**
ATES DRILLED:	**8/17/2007**
/ELL ID	**D-2**

DRILLING INFORMATION

DRILLER:	**Louis LeFever**
BORING DEPTH:	**28 feet**
DRILLING CO.:	**Parratt-Wolff**
RIG TYPE:	**Power Probe 9600T**
METHOD OF DRILLING:	**2 inch push**
SAMPLING METHODS:	**4 foot Macro**

VERTICAL DEPTH	SOIL/ROCK SYMBOLS	SOIL DESCRIPTION	WELL CONSTRUCTION	NOTES	pH



Soil Boring Log

Well ID: E-2

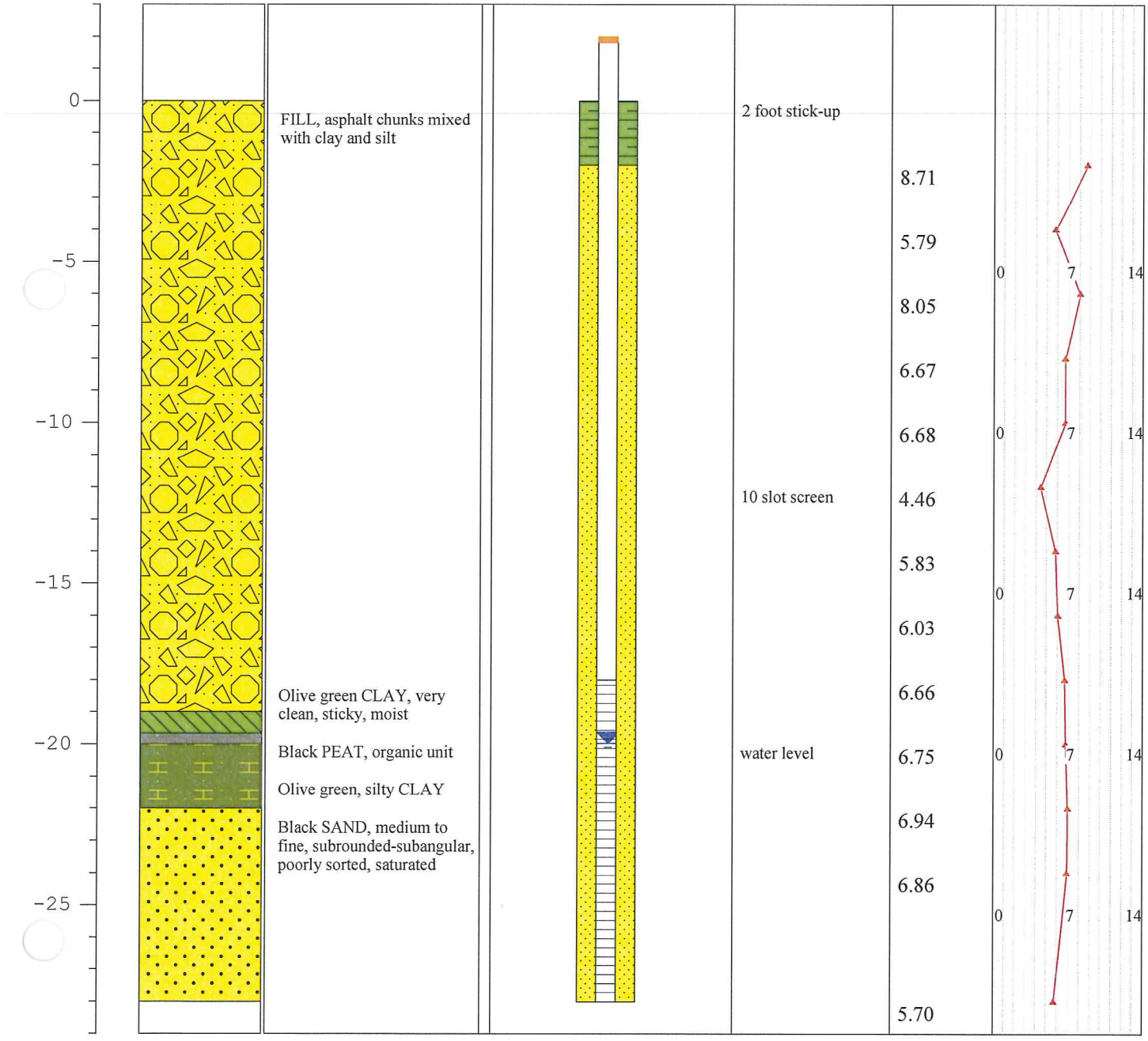
PROJECT INFORMATION

ROJECT:	**Hercules Aqualon**
I OCATION:	**Hopewell, Virginia**
OB NUMBER:	**1201057**
OGGED BY:	**Tim Davis**
ROJECT MANAGER:	**Monty Bennett**
ATES DRILLED:	**8/17/2007**
/ELL ID	**E-2**

DRILLING INFORMATION

DRILLER:	**Louis LeFever**
BORING DEPTH:	**28 feet**
DRILLING CO.:	**Parratt-Wolff**
RIG TYPE:	**Power Probe 9600T**
METHOD OF DRILLING:	**2 inch push**
SAMPLING METHODS:	**4 foot Macro**

VERTICAL DEPTH	SOIL/ROCK SYMBOLS	SOIL DESCRIPTION	WELL CONSTRUCTION	NOTES	pH



ATTACHMENT B

Full Analytical Data Reports

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666
1-800-695-2162
(757) 865-0880
Fax: (757) 865-8014
E-mail: info@universallaboratories.net

Date: Thursday, May 08, 2008

Pages: Page 1 of 7

To: Bill Perkinson
Hercules (Hopewell Plant)

Fax#: (804) 541-4496

From: Mike Jennings

Subject: Results for Project Aqualon/GES Project designated as UL Order Id 0710012 and received on Monday, October 01, 2007

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0710012-001

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0710012

(REPORT DATE)
08-May-08

TO: **Hercules (Hopewell Plant)**
1111 Hercules Road
Hopewell Va 23860
ATTN: Bill Perkinson

Project ID: Aqualon/GES Project
Project # N/A
Site: G-2
Matrix: Groundwater

UL Sample Number: 0710012-001
Sample ID: G-2
Grab Date/Time: 9/28/2007 11:30
Composite Start: N/A
Composite Stop: N/A
Collected By: Client

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.003**	mg/L	0.002	10/8/2007 13:13:00	CC
Nickel (Dissolved)	EPA 200.7	<	mg/L	0.005	10/8/2007 13:13:00	CC
Zinc (dissolved)	EPA 200.7	**0.009**	mg/L	0.005	10/8/2007 13:13:00	CC
Silver (Dissolved)	SW-846 6010 B	<	ug/L	0.05	10/8/2007 13:13:00	CC

Comments for Sample ID 0710012-001
No comments

Respectfully Submitted,
Carol Kleeman

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0710012-001

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0710012

(REPORT DATE)
08-May-08

TO: **Hercules (Hopewell Plant)**
1111 Hercules Road
Hopewell Va 23860
ATTN: Bill Perkinson

Project ID: Aqualon/GES Project
Project # N/A
Site: C-2
Matrix: Groundwater

UL Sample Number: **0710012-002**
Sample ID: C-2
Grab Date/Time: 9/28/2007 13:40
Composite Start: N/A
Composite Stop: N/A
Collected By: Client

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.007**	mg/L	0.002	10/8/2007 13:13:00	CC
Nickel (Dissolved)	EPA 200.7	**0.010**	mg/L	0.005	10/8/2007 13:13:00	CC
Zinc (dissolved)	EPA 200.7	**0.025**	mg/L	0.005	10/8/2007 13:13:00	CC
Silver (Dissolved)	SW-846 6010 B	<	ug/L	0.05	10/8/2007 13:13:00	CC

Comments for Sample ID 0710012-002
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003

North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543

EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0710012

(REPORT DATE)
08-May-08

TO: **Hercules (Hopewell Plant)**
1111 Hercules Road
Hopewell Va 23860
ATTN: Bill Perkinson

Project ID: Aqualon/GES Project
Project # N/A
Site: B-2
Matrix: Groundwater

UL Sample Number: **0710012-003**
Sample ID: B-2
Grab Date/Time: 9/28/2007 14:05
Composite Start: N/A
Composite Stop: N/A
Collected By: Client

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.006**	mg/L	0.002	10/8/2007 13:13:00	CC
Nickel (Dissolved)	EPA 200.7	**0.001**	mg/L	0.005	10/8/2007 13:13:00	CC
Zinc (dissolved)	EPA 200.7	**0.009**	mg/L	0.005	10/8/2007 13:13:00	CC
Silver (Dissolved)	SW-846 6010 B	<	ug/L	0.05	10/8/2007 13:13:00	CC

Comments for Sample ID 0710012-003
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003

North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543

EPA LAB CODE VA00912

0710012-003

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0710012

(REPORT DATE)
08-May-08

TO: **Hercules (Hopewell Plant)**
1111 Hercules Road
Hopewell Va 23860
ATTN: Bill Perkinson

Project ID: Aqualon/GES Project
Project # N/A
Site: A-2
Matrix: Groundwater

UL Sample Number: 0710012-004
Sample ID: A-2
Grab Date/Time: 9/28/2007 14:25
Composite Start: N/A
Composite Stop: N/A
Collected By: Client

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.010**	mg/L	0.002	10/8/2007 13:13:00	CC
Nickel (Dissolved)	EPA 200.7	**0.006**	mg/L	0.005	10/8/2007 13:13:00	CC
Zinc (dissolved)	EPA 200.7	**0.072**	mg/L	0.005	10/8/2007 13:13:00	CC
Silver (Dissolved)	SW-846 6010 B	<	ug/L	0.05	10/8/2007 13:13:00	CC

Comments for Sample ID 0710012-004
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003

North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543

EPA LAB CODE VA00912

0710012-004

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0710012

(REPORT DATE)
08-May-08

TO: **Hercules (Hopewell Plant)**
1111 Hercules Road
Hopewell Va 23860
ATTN: Bill Perkinson

Project ID: Aqualon/GES Project
Project # N/A
Site: D-2
Matrix: Groundwater

UL Sample Number: **0710012-005**
Sample ID: D-2
Grab Date/Time: 9/28/2007 14:55
Composite Start: N/A
Composite Stop: N/A
Collected By: Client

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.012**	mg/L	0.002	10/8/2007 13:13:00	CC
Nickel (Dissolved)	EPA 200.7	**0.005**	mg/L	0.005	10/8/2007 13:13:00	CC
Zinc (dissolved)	EPA 200.7	**0.012**	mg/L	0.005	10/8/2007 13:13:00	CC
Silver (Dissolved)	SW-846 6010 B	<	ug/L	0.05	10/8/2007 13:13:00	CC

Comments for Sample ID 0710012-005
No comments

Respectfully Submitted,

Carol Kleeman

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0710012

(REPORT DATE)
08-May-08

TO: **Hercules (Hopewell Plant)**
1111 Hercules Road
Hopewell Va 23860
ATTN: Bill Perkinson

Project ID: Aqualon/GES Project
Project # N/A
Site: E-2
Matrix: Groundwater

UL Sample Number: **0710012-006**
Sample ID: E-2
Grab Date/Time: 9/28/2007 15:25
Composite Start: N/A
Composite Stop: N/A
Collected By: Client

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.045**	mg/L	0.002	10/8/2007 13:13:00	CC
Nickel (Dissolved)	EPA 200.7	<	mg/L	0.005	10/8/2007 13:13:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	10/8/2007 13:13:00	CC
Silver (Dissolved)	SW-846 6010 B	<	ug/L	0.05	10/8/2007 13:13:00	CC

Comments for Sample ID 0710012-006
No comments

Respectfully Submitted,
Carol Kleeman

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0710012-006